

## CHAPTER 6

# **From Star Wars to the Gulf War: The Air Force Moves to Create an Operational Capability for Space**

**C**onsolidation and crisis marked the decade of the 1980s for the Air Force in the space arena. On the one hand, the newly-created Space Command led the development of an operational focus that involved the shift from consolidating control over space systems to making space systems central to the needs of the warfighter. On the other hand, the space launch crisis at mid-decade led to reexamination of the Space Shuttle's promise and the future military agenda in space. Both developments contributed to the growth and maturity of the operational mindset needed to apply space assets effectively under wartime conditions. By the end of the decade, champions of space could, with justice, point to what they termed the new "operationalization" of space. War in the desert would provide the test.

Buoyed by the new Reagan administration's emphasis on building a strong defense, Air Force leaders anticipated a major effort to develop and apply space systems to meet operational requirements. The Air Force's Space Command would chart the course. Created in late summer 1982, the fledgling command would face a difficult path over the next decade. Although designated the focal point for operational space issues, its experience proved that traditional interests and a fragmented space community could not be overcome immediately. Research and development authorities were especially reluctant to relinquish management responsibility for space systems that they considered best operated by their own more experienced units. Establishing consensus on proper space roles and missions both within and

outside the Air Force presented a challenge for space operators—one they had yet to completely achieve by decade's end. The victory of the operators in 1982 provided only an initial achievement in the struggle to move space out of the shadow of research and development and into the realm of the warfighter.

Ironically, the crisis produced by the *Challenger* tragedy in early 1986 created further momentum for an operational space focus. The explosion of the Shuttle led to a nearly three-year hiatus in the nation's space program, during which leaders quickly realized the old truth that one could not have a space program without the means to get to space. The immediate concern centered on space launch, as military officials reexamined the policy of relying on the Shuttle for military space requirements. Their investigations led to reemergence of expendable boosters as the primary launch vehicles for military space systems, and to the end of the Shuttle's promise of routine access to space with manned, reusable space vehicles. A return to the dependable booster, however, did not mean a return to business as usual.

Beyond the issue of space launch, the Shuttle disaster precipitated a widespread crisis of confidence in both the civilian and military space programs. In the atmosphere of self-doubt during the last half of the decade, a variety of studies and reports reassessed the objectives and capabilities of the nation's space program. Of these, the most important for military space proved to be the Air Force Blue Ribbon Panel investigation in late 1988. Distinguished panel members representing all segments of the Air Force gave the panel's recommendations a degree of credibility absent in earlier studies. Their assessment of space policy, the role of the Air Force in space, and of space in the Air Force established a firm basis for the broad process of "normalizing" space, or for gradually establishing the view that space activities were operational rather than developmental in nature. As operational activities, space operations contributed to achieving Air Force missions just as much as more traditional service activities.<sup>1</sup>

Strongly supported by the Blue Ribbon Panel, the movement to normalize and operationalize space in the late 1980s centered on Air Force Space Command.\* By the end of the decade, this newest Air Force major command had acquired a considerable number of space-based and ground-based space systems, as well as control of the infrastructure to support them. It appeared well on its way to establishing an effective relationship with the unified space command as well as with other civilian and military agencies in the space arena. Above all, Air Force Space Command achieved a landmark victory in its struggle to assume operational responsibilities performed previously by the research and development community when, in 1990, it won operational control of the space launch mission. Almost equally important proved to be the incremental transfer of satellite control activities to the new

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\* Space Command was redesignated Air Force Space Command on 15 November 1985.

command, which began in 1987. The transfer of space launch and satellite control to the operational command represented a crucial victory in the process of institutionalizing space within the Air Force.

At the end of a decade of consolidation and crisis, the Air Force space program had reached a major milestone in the evolution of military space systems from the developer to the operator. Air Force leaders directed their attention to the needs of the warfighter as they sought to make space launch more responsive and space systems more applicable for tactical commanders. Their achievement would soon be put to the test in regional conflict.

### **Space Command Sets an Operational Agenda**

The formation of Space Command on 1 September 1982, the first major command created by the Air Force in thirty years, represented both an end and a beginning. At long last space advocates had convinced the Air Force community that space deserved representation among the operational commands. In an increasingly complex arena, the ad hoc management methods that had resulted in a fragmented space community could no longer be justified. On the other hand, establishing a space command proved only a point of departure. In late 1982 the new command faced the daunting challenge of acquiring ground- and space-based systems, providing an operational focus for the use of space, and serving as the organization best suited to “sell” space to the Air Force. More specifically, the command’s initial mission statement, as described in Air Force Regulation 23-51, dated 25 July 1983, included responsibility to manage and operate space assets, consolidate planning, define requirements, provide operational advocacy, and “ensure the close interface between research and operational users.” Generally, the command sought to achieve its agenda by expediting the transition of space systems from research and development to operations, and by increasing the evolution of space system applications from national or strategic requirements to those most appropriate to support theater or tactical warfighters.<sup>2</sup>

Space Command began auspiciously with the transfer from the Strategic Air Command (SAC) in 1983 of fifty space and missile warning systems, bases, units, and upgrade projects.\* The initial list included Peterson Air Force Base, Colorado, location of the command’s headquarters, as well as Thule and Sondrestrom Air Bases in Greenland and Clear Air Force Station in Alaska. Space Command also would own Falcon Air Force Station, located near Peterson and designated the future home of the Consolidated Space Operations Center (CSOC). By early 1984 SAC also had relinquished four major space systems, two operational—the Defense Meteorological Satellite Program (DMSP) and Defense Support Program (DSP)—

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\* See Appendix 6-1.

and two in the development and acquisition phase—the Military Strategic and Tactical Relay System (Milstar) and Navstar Global Positioning System (GPS).<sup>3</sup>

*DMSP.* The transfer of the Defense Meteorological Satellite Program from Strategic Air Command to Space Command in 1983 in itself represented an evolutionary shift from strategic to tactical operational applications. In December 1982, shortly after creation of Space Command, the trouble-plagued program achieved a new level of performance with the successful launch from Vandenberg Air Force Base, California, of the first block 5D-2 satellite on an Atlas booster. An Atlas and apogee kick motor launched a second 5D-2 satellite into proper orbit on 17 November 1983, where its Operational Linescan System telescope performed flawlessly in scanning a swath 1600 nautical miles wide thereby covering the globe in nearly 12 hours. Imagery of cloud cover picked up by the optical and infrared detectors, as well as moisture content, temperature, and ionospheric monitoring data, could be stored for later transmission or immediately downlinked to Air Force Global Weather Center at Offutt Air Force Base, Nebraska, or readout stations, one at Loring Air Force Base, Maine, and the other under construction at Fairchild Air Force Base, Washington, as well as numerous tactical terminals deployed worldwide on land and aboard ships. Real-time data received by the terminals reached field commanders to support tactical military operations. Down-linked transmissions passed directly to the Navy Fleet Numerical Oceanography Center at Monterey, California, prior to their merging with Commerce Department satellite data and, then, went to Defense Department users through a global network of weather stations. Ongoing improvements in subsequent 5D-2 satellites included plans for more reliable inertial measurement units and celestial sensor assembly units, computers with larger memories, and more efficient solar array panels.<sup>4</sup>

At the same time, planners looked ahead to a new type of satellite, referred to as Block 5D-3, which would be designed for launch either on the Space Shuttle or on an expendable booster. Hoping to begin development in 1986, officials worried that designing and building a Shuttle-compatible satellite would delay delivery of the first Block 5D-3 spacecraft by a year. Moreover, funding constraints threatened to delay the next two in the series, which could leave an additional gap in orbital coverage. Planners thus began considering use of refurbished Titan II missiles as launch vehicles. As with the other satellite programs, future progress would depend on the Space Shuttle's development and the solution of ongoing technical and budget challenges.

*DSP.* Space Command also gained operational control of the Defense Support Program, the central element in the nation's space-based early warning system that monitored missile launches and nuclear detonations. The three operational satellites, each measuring 21 feet high by 10 feet in diameter, contained a telescopic

infrared sensor for detecting missile launches, an additional (RADEC I) sensor for nuclear detection, and star sensors for attitude determination. Signal processing electronics within the infrared sensor helped to discriminate between signals representing missile launches and other radiation sources. Computers housed in the system's two ground stations completed the process of signal discrimination. An improved satellite, designated #12, had received a modified star sensor, new power supplies for command decryption units, and an upgraded nuclear detection package. Following deployment of a DSP satellite in early 1984 aboard a Titan 34D/Transtage combination, future satellites of this kind would be configured for launch by the Space Shuttle.<sup>5</sup>

*Milstar.* In 1983, Space Command received management responsibility from SAC for the extremely high frequency (EHF) joint-service Military Strategic and Tactical Relay System (Milstar) program, then in the early stages of satellite concept definition and communications terminal development. Defense Department officials planned for Milstar to provide worldwide jam-resistant voice communications for the National Command Authorities and, ultimately, to serve as the main element in the Military Satellite Communications System (MILSATCOM), replacing the Navy's Fleet Satellite Communications System (FLTSATCOM), the Air Force Satellite Communications System (AFSATCOM), and multiuser Defense Satellite Communications System (DSCS) networks. The Air Force contracted through Lockheed Missiles and Space Company for development of the satellite and control system, while MIT's Lincoln Laboratory prepared a Milstar-compatible device for use on Fleet Satellite Communications spacecraft in order to support operational testing of terminals. The Navy supervised terminal development by each of the services to ensure commonality and sufficient logistical support. Air Force planners looked to the Space Shuttle as the future launch vehicle for Milstar in the late 1980s or early 1990s.<sup>6</sup>

Meanwhile, the Defense Department's main long-haul moderate-to-high-data-rate communications satellite system, the super high frequency (SHF) Defense Satellite Communications System (DSCS), also progressed by means of the launch in late 1982 of the first DSCS III satellite, which joined the three DSCS II satellites in geostationary orbit and achieved full operational status in May 1983. The new satellite benefited from improved physical and electronic survivability measures, while 21 new AN/GSC-39 medium terminals replaced the obsolete ground terminals, and work continued to convert the entire system from analog to digital transmission by the end of the decade. Although the Air Force retained responsibility for the space or satellite segment, overall management responsibility remained with the Defense Communications Agency rather than being transferred to Space Command. The Army continued its responsibility for the ground segment, which planners expected to improve with the addition of five fixed and six mobile operations centers.

Eventually, DSCS would join the other defense support satellite systems which depended on the Space Shuttle for launch.

*Navstar GPS.* When turned over to Space Command in early 1984, the Navstar Global Positioning System project was nearing the end of its successful validation phase, during which a limited constellation of five to seven prototype Block I satellites, orbiting at an altitude of 10,900 nautical miles, provided navigation signals transmitted from atomic clocks through a 12-element antenna array to various types of user equipment. The GPS control segment consisted of several monitor stations, a master control station, and ground antennas. Improved Block II satellites for the operational system would have nuclear-protective hardness, longer and more accurate navigation signals, and measures to prohibit unauthorized use. Although Rockwell International had experienced problems building and testing the new satellites, the company still planned to meet the schedule, which called for the initial launch aboard the Shuttle in October 1986 with a Payload Assist Module (PAM-DII) upper-stage vehicle.<sup>7</sup>

By the end of 1987, planners expected GPS to provide worldwide, two-dimensional coverage 24 hours daily and, when fully deployed as a 21-satellite constellation (18 operational spacecraft and 3 spares) in December 1988, full worldwide three-dimensional coverage that would enable users to determine their position to within 15 meters fifty percent of the time and 27 meters ninety percent of the time. By then, the master control station would be functioning in the Consolidated Space Operations Center, which the Air Force began to construct in 1983 at Falcon Air Force Station, Colorado, while a monitor station would be installed at nearby Peterson Air Force Base. The deployed system would rely on three types of user sets already undergoing testing in aircraft, on naval surface vessels, in wheeled and tracked vehicles, and by foot soldiers. The Defense Department hoped future funding would permit the purchase between 1984 and 1997 a total of 23,000 improved user sets that relied on more sophisticated software programming. Although the Air Force served as resource (program) manager, GPS continued as a joint-service program. There were deputy program managers from the Army, which handled the ground segment, and the Navy and Marine Corps, as well as the Defense Mapping Agency, Department of Transportation, and the North Atlantic Treaty Organization (NATO).<sup>8</sup>

Together with the space infrastructure transfers, the four satellite programs provided Space Command a strong initial space system foundation to build upon over the course of the decade. As demonstrated by the command's early experience with the Strategic Air Command (SAC), the effort proved difficult. Despite its willingness to divest itself of missile warning and space surveillance systems, SAC sought to retain a strong operational voice in the control of space systems in the period prior to formation of the unified space command in the fall of 1985. SAC's attempt to preserve an operational hand in the Navstar GPS program, for example,

had delayed its transfer to Space Command until the first month of 1984. In fact, during the two years after creation of Space Command, SAC commander General Bennie L. Davis and his staff proposed that resource management for future space-based systems be divided between operational resource management and support resource management. While General James V. Hartinger's command would retain responsibility for support management, the operational issue would be determined by a particular system's mission. Arguing that systems are independent of the "basing" mode and that unity of command should not be violated, Davis and his staff believed offensive-oriented space systems should be subject to SAC's direction while Space Command should retain resource management responsibility for defensive strategic systems. SAC also turned to the traditional Air Force view of the nature of space to argue its case. If space represented a place and not a mission—hence a medium where space assets could satisfy a variety of missions for a number of commanders—Space Command should not attempt to own all space assets in order to perform a space "mission." According to General Davis, SAC, as an operational user, should be accorded basic responsibilities to "advocate, deploy and employ strategic offensive systems in the space environment" through operational resource management.<sup>9</sup>

General Hartinger countered by arguing that the SAC proposal would further fragment the space operations structure, confuse the wider Air Force community, and heighten the "current level of ambiguity." Although the close personal ties between Generals Davis and Hartinger, along with formation of United States Space Command in September 1985, served to alleviate the immediate problem between the two commands, the controversy suggested the difficulties Space Command would continue to face as it moved to consolidate its position as the operational command for the space "mission."<sup>10</sup>

Air Force Systems Command proved to be a more challenging obstacle to Space Command's pretensions to operational space leadership. In this case, the historical role of the research and development command in space operations made it a reluctant participant in the movement to transfer operational control of space assets to the fledgling command. Space Command's mission statement included its responsibility to "ensure close interface between research and operational users," and the appointment of Air Force System Command's Space Division commander as vice commander of Space Command until 1 October 1985 contributed to this end. Yet the larger issue of when the point arrived at which a space system moved from "experimental" to "operational" remained open to debate. Given the complex, unique nature of the space environment and the systems functioning in the medium, Air Force Systems Command questioned the competence of the "inexperienced" operational command and favored lengthy on-orbit checkout procedures and repeated use to achieve "commonality" and consistency of operations before turning over systems to Space Command.<sup>11</sup>

As a result, Air Force Systems Command proved reluctant to hand over satellite control and space launch responsibilities. Not until late 1987 would Air Force Space Command acquire the Air Force Satellite Control Network. The Consolidated Space Operations Center (CSOC) represented the network's primary operational element. Although construction of the CSOC began in May 1983, it seemed an inordinately lengthy process to Air Force Space Command before it became operational in March 1989, two years after the projected date for initial operational capabilities for GPS and DSP. Air Force Systems Command argued that funding, management, and technical problems, together with evolving requirements, accounted for the "delayed" turnovers. In 1986 and 1987, studies of the CSOC's capabilities determined that current and programmed CSOC facilities and equipment could not support intensive launch recovery operations forecast for the early 1990s. As a result, planners decided to build a new mission control center in space made available when construction of the CSOC's Shuttle Operations and Planning Complex was canceled after the *Challenger* disaster. This requirement further delayed completion of the CSOC. While Air Force Space Command became the resource manager of the Air Force Satellite Control Network in 1987, Air Force Systems Command retained several important responsibilities, including operation of the Satellite Test Center at Onizuka Air Force Station, California. Not until 1993 would Air Force Space Command receive final turnover of the CSOC, thus completing the transfer of all Air Force Satellite Control Network elements and responsibilities.<sup>12</sup>

Space launch would remain the responsibility of the research and development command until the fall of 1990 when Air Force Space Command gained authority to begin a phased takeover. Even then, only strong pressure from Air Force headquarters and Defense Department officials compelled Air Force Systems Command and its Space Division to comply. The space launch issue represented the most intriguing and important element in the development of Air Force Space Command as the operational focal point of Air Force and Defense Department space operations. From the vantage point of 1990, official studies and histories note that Air Force Space Command had focused on acquiring the space launch mission since its activation in 1982. Before the *Challenger* catastrophe, the launch issue created little controversy between Air Force Systems Command and Air Force Space Command. In November 1982 the new operational command received responsibility for Space Shuttle contingency operations. When completed, the CSOC would provide Air Force Space Command not only control of satellite operations through its management of the facility's Satellite Operations Complex but also an active role in Defense Department Shuttle operations through its participation with Air Force Systems Command in the operation of the collocated Shuttle Operations and Planning Complex (SOPC). Concerned about Air Force System Command's deliberate approach to turning over space systems, Space Command sought and obtained an agreement in 1984 whereby the two commands recognized that Space Command



would assume more responsibility for space systems. Air Force Systems Command argued, however, that expendable launch vehicles should not be considered “operational” because each launch involved unique payload and mission demands. As such, space launch did not represent an operational task and should be omitted from the agreement. Space Command concurred. With the Shuttle designated as the primary space launch vehicle for all future Defense Department missions, Space Command expected to gain responsibility for the bulk of the space launch mission with activation of the CSOC. Later, when expendable launch vehicles gained a new lease on life after the *Challenger* tragedy, Air Force Space Command would reopen the issue of space launch responsibility.<sup>13</sup>

### **A United States Space Command Joins the Space Community**

On 23 September 1985, Space Command’s position in the military space arena received an additional challenge with the creation of United States Space Command, a unified command for space operations directly responsible to the Joint Chiefs of Staff. When the Air Force announced its intention to establish its own Space Command in May 1982, the official statement expressed the view that “it is the Air Force’s hope and belief that Space Command will develop quickly into a unified command.”<sup>14</sup> By early 1983, all signs pointed to the imminent creation of a unified operational command for the military space activities of all the services as the “next logical step” to centralize and maximize space operational effectiveness. Yet twenty-five years earlier, Air Force leaders had strongly opposed the Navy’s repeated attempts to diminish the growing Air Force space mission by proposing a unified command. Now the two sides had reversed positions. What had happened? Clearly the world of military space had undergone remarkable changes in the previous quarter century. While Air Force responsibility for space by the mid-1980s embraced 70 percent of all Defense Department space systems and 80 percent of the budget, program management had to be shared with the other services, as well as Defense Department and civilian agencies. Moreover, the increasing reliability and effectiveness of second- and third-generation space systems created greater support from a growing user community for a single Defense Department organizational focus for space operations. In the final analysis, establishment of a unified United States Space Command proved to be a prerequisite for Navy and Army approval of an Air Force Space Command.<sup>15</sup>

The Defense Department’s space policy of June 1982 and President Reagan’s national space policy of July 4th of that year focused on ready access to space and the importance of military space by stressing the need to integrate into operational commands survivable space assets that supported tactical applications. The initial impetus of the administration’s new policy led to the creation of the Air Force’s Space Command on 1 September 1982. At the same time, the Joint Chiefs of Staff polled the warfighting commanders-in-chief (CINCs) for their views on space

requirements, while joint exercises in 1982 and early 1983 involved elaborate space scenarios for the first time. Meanwhile, shortly after activation of Space Command, General Hartinger and his staff developed procedures and a rationale for a unified space command that would involve his Air Force major command as the “core” component of the unified command. As such, the Air Force would take the lead in coordinating all American military space operations, and he would serve as commander of both the unified and major commands, as well as the North American Aerospace Defense Command (NORAD).<sup>16</sup>

Above all, the planning and support for a unified space command received a crucial boost from President Reagan’s Strategic Defense Initiative (SDI). On 23 March 1983 President Reagan concluded a dramatic speech on national defense by proposing a major national—and later international—program to develop technologies capable of defending against ballistic missiles. In ringing tones he declared, “I call upon the scientific community in our country, those who gave us nuclear weapons, to turn their great talents now to the cause of mankind and world peace, to give us the means of rendering these nuclear weapons impotent and obsolete.” If achieved, gone would be the 1960s doctrine of Mutual Assured Destruction which relied on massive nuclear retaliation as the ultimate deterrent. In its place, Reagan proposed Mutual Assured Survival, a “positive” alternative strategy based on strategic defensive systems capable of destroying ballistic missiles in flight, leading to the objective of eliminating the threat of ballistic missiles entirely. The proposed change in the nation’s space policy represented an enormous break with past developments because, if accepted and funded by Congress, it would permit weapons in space.<sup>17</sup>

To some, the Strategic Defense Initiative, as the administration eventually termed the President’s proposal, appeared visionary. Others found it naive and more suitable to the “Star Wars” label it quickly received, suggesting a saga out of science fiction, as in the 1977 motion picture of the same name. In any case, SDI clearly turned the spotlight of attention on strategic aerospace defense in unprecedented fashion. President Reagan’s speech had an electric effect on the space community. Because SDI would clearly be dependent on space-based systems, it compelled officials to review the entire role of space in military operations. In effect, SDI provided additional incentive and broader support to proceed with a unified space command, which seemed the sensible organization to become the operational focus for SDI planning and systems operations.

When the Joint Chiefs of Staff in April 1983 requested suggestions for the best organizational means of supporting SDI, General Hartinger responded with his proposal for a unified command. He immediately realized the potential of SDI to enhance the importance of his command, and he hoped Space Command would become responsible for Air Force participation in the test program. In June, Air Force Chief of Staff General Charles Gabriel concurred on the need for a unified command. The Navy’s decision to activate its own space command on 1 October

1983 served to increase support, although the Navy itself remained generally unenthusiastic about a unified structure that would be dominated by the Air Force.<sup>18</sup>

Early in 1984 General Gabriel and Air Force Secretary Verne Orr, in a joint statement, reaffirmed Air Force support for a unified command by asserting that “no single military organization exercises operational authority over military space systems in peace, war, and the transition period from peace to war.” Late that year President Reagan approved the recommendation from the Secretary of Defense and the Joint Chiefs of Staff. Following extensive studies on roles and missions, the United States Space Command was activated on 23 September 1985. Appropriately, on hand for the ceremony was retired Admiral Arleigh Burke, who had unsuccessfully championed the cause of a unified command in 1959 and 1960.<sup>19</sup>

### **The Growing Conflict Over Space Roles and Missions**

As proposed by General Hartinger, the arrangement also called for the unified commander-in-chief to serve as commander of Air Force Space Command and commander-in-chief of NORAD. From the start the command structure created tension and raised issues similar to those that earlier beset the Air/Aerospace Defense Command.<sup>20</sup> As NORAD commander-in-chief, General Hartinger needed to deal with a Canadian partner that had never been comfortable with SAC’s control of “defensive” space assets from 1979 to 1982 and, now, had grave reservations about its own role in the Strategic Defense Initiative. Moreover, the unified command received operational control of the missile warning and space surveillance missions, which meant that its personnel exercised peacetime as well as wartime control over Air Force space assets in the Cheyenne Mountain Complex’s Space Surveillance and Missile Warning Centers. The issue of peacetime control remained relatively unimportant as long as the same individual headed the unified and major Air Force commands; but in October 1986, the Air Force elected to separate leadership of the commands, leaving Air Force Space Command with a two- rather than four-star general and without responsibility for day-to-day operation of crucial space resources. As a result, the space roles and missions debate would resurface with a vengeance in the last half of the decade as the Air Force sought to redefine its institutional commitment to space.<sup>21</sup>

The saga of the Air Force Space Plan, as well as various other doctrinal and mission statements, also reflected tension between Air Force Space Command and Air Force Systems Command, specifically, and within the Air Force, generally, as the space community attempted to develop a uniform approach to space operations. Just over a year after its activation, on 18 November 1983, Space Command accepted custodianship of the Space Plan, the first approved by the Air Staff since the early 1960s. This seemed entirely appropriate given the command’s mission responsibility to “consolidate planning..., define requirements..., and provide advocacy...for Air Force space issues.” The Air Staff viewed the document as a comprehensive,

integrated long-range planning effort involving space activities, missions, and operations. It would serve to justify a future space investment strategy that would ensure continued procurement and funding support. Air Force leaders also considered the plan an educational tool that embodied corporate thinking on space and, thus, could help institutionalize space within the service.<sup>22</sup>

Planners hoped to update the Space Plan periodically to reflect the evolving space community. When Space Command received the plan in 1983, it became responsible for 21 of the required 37 actions to implement the document. By the end of 1984 the command had completed 10 actions.\* Although most requirements could be completed without difficulty, Space Command repeatedly failed to reach agreement with the Air Staff and U.S. Space Command on interpretation of appropriate mission area functions. What appeared to be minor differences over space operational terminology in fact represented profound disagreement on proper roles and missions, as well as widespread uncertainty on the role of space in the Air Force. The document, which was expected to help unify the Air Force on space, actually became more of a hindrance.<sup>23</sup>

The Air Force Space Plan described the general uses of military space and identified four specific terms for space operations. "Space control" involved maintaining freedom of action in space and denying the same to the enemy. "Space support" referred to the deployment, maintenance, and sustenance of equipment and personnel in space, primarily by means of space launch and on-orbit repair or recovery. "Force enhancement" referred to traditional defense support functions such as communications, navigation, and weather designed to "enhance" terrestrial and space-based forces. "Force application" referred to the performance of combat functions from space.<sup>24</sup>

Air Force Space Command asserted that the use of this terminology in Defense Department space policy and in the Air Force as a whole differed in key respects from policy followed by U.S. Space Command, which relied for guidance on JCS Publication Number 1 and the Unified Command Plan. The unified space command focused on two mission areas, space control and space support, and subsumed under these areas force enhancement and force application. According to U.S. Space Command, space control involved all aspects of the space defense mission, including force application, while space support involved force enhancement functions. Air Force Space Command's staff especially opposed the unified command's interpretation of space support. The major command's planning chief, Brigadier General G. Wesley Clark, for example, explained that for U.S. Space Command, the space support function included support to terrestrial forces, an employment function that rightfully fell within its area of responsibility. It

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\* See Appendix 6-2.

also involved, however, the preparation, maintenance, and sustenance of space forces, which was a space service support function that properly belonged to the Air Force and should be assigned to Air Force Space Command. To clarify the situation and to avoid promoting the wrong perception of the nature of space operations, General Clark proposed that space support be subdivided into “space combat support” and “space service support,” with U.S. Space Command responsible for the former and Air Force Space Command the latter, which would also involve coordination with NASA.

In effect, Air Force Space Command proposed modifying the traditional mission functions with special terminology to account for the unique nature of operating in space. Neither U.S. Space Command nor the Air Staff, however, proved amenable to the changes. By 1985 the Air Force Space Command staff successfully incorporated into its draft revision the results of various studies, such as *Space Systems Architecture 2000*, operational intelligence and antisatellite plans, satellite control architecture, and a military man-in-space plan that examined military roles for the Shuttle’s Spacelab program. Nevertheless, the Air Force Space Command’s Space Plan repeatedly failed to gain Air Staff approval. Likewise, disagreement over space terminology plagued every effort by Air Force Space Command to achieve consensus on space operational doctrine and a revised command mission statement. The different interpretations of space terminology reflected the larger issue of appropriate command responsibilities that continued to divide the parties. Indeed, throughout the 1980s all attempts to update the Space Plan, revise the command’s mission statement, and publish operational space doctrine floundered. The failure to produce a revised Space Plan suggests the difficulty of reaching consensus within the Air Force space community, which sought to make space an accepted “mission” throughout the service.<sup>25</sup>

Nevertheless, by mid-decade, space operators could point to major achievements in the establishment and growth of both Air Force Space Command and the U.S. Space Command. To be sure, command relationships needed sorting out and a reluctant Air Force Systems Command would require considerable prodding before relinquishing its traditional hold on space systems. Even so, Air Force space leaders had good reason for optimism in the era of the Space Shuttle. After 1986, however, Air Force space issues would be played out against the background of the *Challenger* tragedy, which forever altered the landscape of future national space operations.

### **The Challenger Disaster Creates an Uncertain Launch Future**

NASA had expected a triumphant but routine mission of the orbiter *Challenger* on 28 January 1986 in celebration of the Space Shuttle’s twenty-fifth flight. Initiating use of the nation’s second Shuttle pad at the Kennedy Space Center, Mission 51-L was to launch the “first teacher in space,” Christa McAuliffe, perform unprecedented observations of Halley’s Comet, and deploy one of the space agency’s

Tracking and Data Relay Satellites. After cold weather delayed the flight for several days, the *Challenger* rose from its launch site that January morning at 11:39 a.m. Eastern Standard Time. Just 73 seconds after liftoff, a massive explosion destroyed the spacecraft, killing all seven crew members and plunging the nation's space program into the greatest crisis in its young history.<sup>26</sup>

While the nation justifiably focused on the *Challenger* tragedy, military space officials had additional worries. In early 1986 the Air Force had only begun to recover from the failure in August 1985 of its Titan 34D rocket, which had to be destroyed when one of its engines shut down after liftoff and the rocket veered off course. Then, in April 1986, another Titan 34D exploded over its launch pad at Vandenberg, and in May NASA lost a Delta rocket. After those launch vehicle failures, space leaders effectively grounded the space program by prohibiting further flights of the Shuttle and expendable launch vehicles (ELVs) until the problems could be solved. The nation confronted an ailing space industry and a space program in disarray. President Reagan appointed a commission chaired by former Secretary of State William P. Rogers to investigate the *Challenger* accident. Among other findings, the commission's exhaustive report, issued on 6 June 1986, concluded that defective seals between two solid-rocket-motor sections sparked the chain of events that produced the explosion. NASA had much work to do before confidence in manned spaceflight could be restored.<sup>27</sup>

Without an assured heavy-lift launch capability, the military space program also found itself in crisis. The Shuttle had been designated the primary launch vehicle for all future Defense Department payloads, and the Titan 34Ds had been scheduled only until the Shuttle achieved its full flight schedule in the late 1980s. The Air Force expected to run out of expendable boosters sometime in 1988. Programs most immediately affected by the grounding of the Shuttle would be the Navstar Global Positioning System (GPS) and the early warning Defense Support Program, although others would suffer from launch delays and the related "ripple" effect. Payloads previously manifested for the Shuttle would remain in storage rather than replenish aging satellite constellations. There, while expensive investigations continued, they would generate a high cost while officials worried about potential atrophy and projected booster replacements.<sup>28</sup>

The *Challenger* accident proved to be a watershed in the nation's space program. The moratorium on Shuttle flights, which extended for 31 months, forced civilian and military leaders to investigate not only the future of space launch but the nation's entire space program. During the hiatus Air Force officials led the way in reassessing the military space program. By the time the Shuttle resumed operations on 29 September 1988, the Defense Department's relationship with NASA had been transformed and the Air Force had immersed itself in a searching self-examination of its commitment to space.

The *Challenger* tragedy had not caught the Air Force totally unprepared. Several years earlier, doubts about relying exclusively on four very complex space launch vehicles had prompted Air Force officials to pursue a “mixed fleet” concept of complementary expendable boosters. Indeed, the Air Force had never been comfortable with the decision to rely entirely on the Shuttle for space launch. Back in the mid-1970s, writers on Air Force issues noted that earlier “resigned acceptance” of the Shuttle as the space transportation system for both civilian and military users had evolved into “cautious enthusiasm.” After all, Shuttle proponents predicted routine, high-capacity, fast-turnaround access to space with a schedule of 60 flights per year (40 at the Kennedy Space Center and 20 at Vandenberg Air Force Base) at half the cost of expendable boosters. The Shuttle also promised to preserve a manned, military presence in space and achieve the long-sought goal of normalizing space operations through standardized, reusable launch vehicles. To maintain funding and political support for the Shuttle, NASA officials insisted the Defense Department commit to a “Shuttle-only” policy and phase out its fleet of expendable launch vehicles. The Defense Department agreed.<sup>29</sup>

A 14 January 1977 Memorandum of Understanding (MOU) between NASA and the Air Force, as the Defense Department’s executive agent for the Shuttle, formally confirmed Shuttle program responsibilities. NASA would be responsible for Shuttle development, flight planning, operations, and control, regardless of the user, as well as landing-site arrangements at the Kennedy Space Center and overall financial management. The Air Force, for its part, would develop a controlled node at the Johnson Space Center for classified missions, and supervise integration of military flights, construct a second launch facility at Vandenberg Air Force Base, and build an inertial upper stage (IUS) vehicle, a two-stage solid-propellant upper stage carried into orbit in the Shuttle cargo bay, to lift payloads from the Shuttle to higher altitudes and inclinations. NASA expected to use the IUS for its ambitious planetary missions. For all intents and purposes, military space launches would be accomplished exclusively by the Space Shuttle. The reusable Shuttle would make the expendable launcher truly expendable once and for all time.<sup>30</sup>

NASA initially expected to begin test flights in 1980. By the spring of 1979, however, agency officials had slipped the initial operating date to early 1981 in light of technical problems and related cost increases. The technical challenges associated with the Shuttle’s complex design and payload configuration proved more difficult to master than expected. The Defense Department became alarmed that further delays would result in an unresponsive space launch program and a diminished operational flight schedule in the next decade. Critics increasingly faulted NASA’s research and development mentality and called for more military involvement in Shuttle management. Military concerns prompted Carter administration officials in 1978 and 1979 to conduct high-level policy reviews, which led in March 1980 to a modification of the 1977 NASA-Defense Department agreement. The revised accord

sought to accommodate the military by assigning priority to the Defense Department in Shuttle mission preparations and flight operations, and by integrating Defense Department personnel more directly into NASA's line functions.<sup>31</sup>

Despite a tilt in the Defense Department's favor, the Air Force remained uneasy about its commitment to a Shuttle-only policy. In 1980 both the Air Force Scientific Advisory Board and the Defense Science Board addressed the space launch issue. Citing Shuttle delays, the likely lack of an "on-call" launch capability, and the general austerity of space launch assets, the two boards proposed a "mixed fleet" policy of using both the Shuttle and expendable boosters for military payloads. At this time officials remained uncertain whether the mixed fleet concept should become a permanent policy or only be pursued until the Shuttle proved capable of fulfilling its early promise of routine spaceflight.<sup>32</sup>

Meanwhile, the Air Force had decided to use the Titan 34D as its heavy-lift booster during transition to the Shuttle, while the IUS would be configured for both Titan and Shuttle vehicles. By 1982, however, NASA had backed out of the IUS joint purchase arrangement with the Air Force, which meant higher costs for the Air Force vehicle. Worried that the IUS two-stage vehicle would be underpowered for planetary missions, NASA expressed renewed interest in the liquid-propellant Centaur G, the most powerful upper-stage vehicle in the space arsenal. NASA's flip-flop on its commitment to the IUS provided ammunition for critics of the civilian agency's competence and management practices.<sup>33</sup>

By the early 1980s, NASA had further lowered its Shuttle flight predictions from a planned 14 launches in 1984 and 24 per year by 1986 to 5 in 1984 and 13 in 1986. A General Accounting Office (GAO) investigation in 1982 noted that the earlier 1977 projected schedule of 487 flights during the first twelve years of operation had been reduced by more than 50 percent to 234. Although the successful maiden flight of the Shuttle in April 1981 eased some of the tension between NASA and the Defense Department, Air Force leaders still were concerned about phasing out expendable launch vehicles once the Shuttle became operational.<sup>34</sup>

In October 1981 Air Force Chief of Staff General Lew Allen formally identified as a problem the total reliance on the Shuttle and called for study of a "mixed fleet" strategy. The following month Under Secretary of the Air Force and NRO director Edward C. "Pete" Aldridge, who would become a central figure in the space launch arena throughout the decade, appeared before the National Space Club in Washington, D.C., to give a "my views only" assessment of military space issues. Calling for a "new management structure for our space operations," he asserted that the Air Force "cannot continue to look to NASA as our country's Launch Service Organization in the Shuttle era." Although he cited as positive the appointment of Major General James A. Abrahamson as NASA's Associate Administrator for Space Transportation Systems, he argued that the space agency should focus on "developing civilian space assets and transportation systems" and consider leaving operational



responsibilities to others. The under secretary also appeared to favor retention of expendable launch vehicles even after the Shuttle became fully operational. He observed, "It...seems illogical that our only 'truck' to deliver our goods to space be in the form of 3, or 4, or 5 highly complex launch vehicles. Fleet grounding, launch failures, or both could severely limit our access to space." Aldridge noted that new presidential science advisor Jay Keyworth had undertaken a study of the need for a mixed-fleet concept.<sup>35</sup>

Although President Reagan's national space policy statement of 4 July 1982 reaffirmed the Shuttle as the primary launch vehicle, the Air Force sought in 1983 to ensure a sufficient supply of expendable boosters. It officially proposed a mixed-fleet program based on commercial production of the Titan III, along with the purchase of additional Titan 34Ds and refurbishment of Titan II ICBMs. The latter would be used for launching DMSP payloads. The Titan 34D, nearing the end of its scheduled availability, however, could provide only an interim solution, because it could not match the Shuttle in launch weight and volume capacity. Moreover, NASA elected to modify only two of the four Shuttles to handle heavy Defense Department payloads. By the end of 1983, Under Secretary Aldridge, proclaiming the need for "assured access to space," outlined growing Air Force support for the additional step of developing an upgraded Atlas, termed the Atlas II, and a more powerful Martin-Marietta Titan. The latter vehicle would consist of a 200-inch payload fairing to handle a Shuttle-configured Centaur upper stage and a Shuttle-configured payload; it would possess the capability of launching 10,000 pounds into geostationary orbit. Initially referred to as the Titan 34D7 because of its 7 rather than 5° segmented, solid-rocket motors, it soon became known as the Complementary Expendable Launch Vehicle (CELV), then later the Titan IV.<sup>36</sup>

By early 1984 the Defense Department had accepted the Air Force position. A "Defense Space Launch Strategy" statement, issued on 23 January, declared that:

while affirming its commitment to the STS [Space Transportation System], DoD will ensure the availability of an adequate launch capability to provide flexible and operationally responsive access to space, as needed for all levels of conflict, to meet the requirements of national security missions.<sup>37</sup>

In support of an "assured access to space" policy, the defense secretary approved the Air Force plan to procure 10 Titan 34D7s, or Complementary Expendable Launch Vehicles. The Air Force hoped to see the CELVs enter the inventory by 1988 to support a schedule of two launches per year.

NASA officials found themselves on the defensive, pleased with neither the prospect of a competitive booster nor the growing criticism of its relationship with the military. Critics inside and outside Congress had been castigating the "militarization" of the Shuttle program for several years. The civilian agency, they asserted, had signed a "pact with the devil" by according the military priority on the Shuttle

manifest, by placing active military officers in key NASA posts, and by supplying the bulk of development funding. In response, however, NASA defended its relationship with the Defense Department. Glynn Lunney, manager of the Space Shuttle program at Johnson Space Center, even favored strengthening the already close ties. In late 1983 a General Accounting Office report examined NASA-Defense Department funding disparities and recommended Congress withhold support for the Shuttle Operations and Planning Complex (SOPC) at Falcon Air Force Station near Colorado Springs until the Defense Department and NASA developed effective, long-term operational objectives. In response, Lunney defended the SOPC as strengthening the “separateness” of military and civilian space activities. He also saw nothing amiss in NASA’s funding of the “national” space transportation system. From his standpoint, the military earlier had gained experience with unmanned space systems but had neglected manned spaceflight. “It is now time,” he asserted, “for the DoD to fully embrace and exploit the manned spaceflight capabilities which NASA has developed for our nation.” Doing so would put the military squarely behind the Shuttle. In early 1984 NASA officials fervently lobbied against the Complimentary Expendable Launch Vehicle because, they said, it would result in lower Shuttle flight rates and higher costs.<sup>38</sup>

NASA had another reason for concern when Under Secretary Aldridge called for commercial production of expendable launch vehicles as a means of providing the Defense Department more affordable backup boosters. Commercial ELV production would infringe on NASA’s Shuttle marketing operation. In the early 1980s, when the European Space Agency’s successful marketing of the Ariane rocket threatened to corner the commercial satellite market, NASA received permission to promote the Shuttle commercially at artificially low prices. The American ELV industry, meanwhile, had been blocked from commercial competition and, subsequently, had suspended production in light of the military’s Shuttle-only policy. NASA expected to recoup its costs later in the decade through cost-effective commercial operations, but it had based its planning on erroneous estimates of yearly flights, without accounting for such vagaries as mechanical difficulties, weather delays, and slow turnaround procedures. After four orbiters and six years of operation, *Challenger*’s January 1986 mission had represented only the twenty-fifth orbiter flight. At the same time, the producers of satellites had proceeded on the assumption that future flights would be cheap and frequent. By 1984 the Reagan administration had become sufficiently concerned about the likely shortfall in NASA’s commercial operations to pass the 1984 Commercial Space Launch Act, which sought to ease the cumbersome, bureaucratic launch process by centralizing all commercial launches under the Secretary of Transportation. At the same time, the act also tended to move NASA out of the private launch business.<sup>39</sup>

Despite NASA’s objections, the Air Force went ahead with a contract in February 1985 for development of the Titan IV. As Under Secretary Aldridge declared, “we

cannot have our access to space as 'fragile' as it will be without ELVs complementing the Shuttle." In August 1985, the administration confirmed the decision through a National Security directive titled "National Space Strategy," which authorized a limited number of ELVs as part of the mixed-fleet approach to support "assured access to space." By that time NASA had dropped its objection to the Air Force's procurement of ten Titan IVs in return for a Defense Department commitment to book one-third of all forthcoming Shuttle flights.<sup>40</sup>

Before a Joint Subcommittee on Space Science and Applications in July 1985, a number of prominent military space figures addressed the subject of "Assured Access to Space During the 1990s." Congressional officials wanted to know whether the space leaders favored production of a fifth Shuttle orbiter. General Abrahamson, now head of the SDI program; Lieutenant General Donald J. Kutyna, Air Force Director of Space Systems and Command, Control and Communications; and General Robert T. Herres, commander-in-chief of NORAD and commander of Space Command, argued for a limited ELV program and against an additional Shuttle orbiter. Noting that the early decision to rely on the Shuttle had left little funding over the years for launch-related technology, they supported an advanced launch system technology program to replace the Shuttle by the turn of the century. Air Force Under Secretary Aldridge agreed when he testified before the subcommittee. He expressed concern about the Shuttle's ability to support all scheduled Defense Department flights in addition to NASA's domestic and foreign commitments. Aldridge declared that, assuming no major delays, four orbiters could likely meet the Defense Department's expectations—but only with programmed Titan IV and Titan II payloads as part of the launch plan.<sup>41</sup>

Moreover, the precise heavy-lift requirements for the Strategic Defense Initiative and NASA's proposed space station were yet to be determined. The technological initiative for development of a new expendable launch system drew increasing support following an Air Force Space Command study, the *Space Transportation Architecture Study*, which concluded that payload requirements involving SDI and the space station would likely exceed booster capabilities in the late 1990s. The new launcher proposal, referred to as the Advanced Launch System (ALS), incorporated the Strategic Defense Initiative Organization's requirement for a heavy-lift vehicle capable of launching 150,000 pounds into low-earth orbit. The Air Force also expressed interest in such a vehicle, which would have three times the lifting capacity of the Space Shuttle. By the end of the decade, the ALS program would be restructured to promote new booster technology for a variety of requirements.<sup>42</sup>

On the eve of the *Challenger* disaster, the Shuttle remained the centerpiece of America's space launch program. Although the Air Force's commitment to the Shuttle as its primary launch vehicle had been tempered by diminishing expectations, it hoped that the addition of a limited number of "mixed fleet" expendable boosters would aid in realizing the Shuttle's lofty promise. The foresight and

concern of Air Force leaders helped cushion the shock of the *Challenger* and Titan losses at mid-decade.

### The Response to the *Challenger* Shock Waves

In the aftermath of the *Challenger* disaster and the expendable booster failures, the nation's launch activities came to a near standstill while officials awaited the Rogers Commission report amidst widespread soul-searching and public criticism. A variety of "experts," with the benefit of hindsight, claimed to have foreseen the disaster and the policy failure that led the nation to rely solely on the Shuttle for America's space launch future.<sup>43</sup>

During the moratorium on Shuttle flights, NASA conducted political damage control and turned to the military for assistance. As part of its recovery plan, NASA appointed Admiral Richard H. Truly as Associate Administrator for Space Flight, Space Division Commander Lieutenant General Forrest S. McCartney as Director of the Kennedy Space Center, and also turned for advice to its former deputy director of the Apollo program, General Samuel C. Phillips. Not only did NASA specifically request help in a variety of areas, it agreed that military missions should take precedence on future Space Shuttle flights. It also agreed to a temporary mixed-fleet space launch policy. At the same time, the administration ordered NASA out of the commercial launch business, which opened the door to a resurgence of the expendable launch vehicle business.<sup>44</sup>

Moreover, when the Rogers Commission report appeared in June 1986, it advocated a Space Shuttle with lower weight and payload capabilities and a conservative launch schedule. The Air Force interpreted this as more reason to focus on dependable unmanned boosters, and worked to find launch vehicles for its delayed inventory of satellites. As the Shuttle launch schedule showed increasingly lengthy delays, the Air Force estimated that as many as 25 payloads would be affected and that the launch backlog could not be overcome before 1992. As the situation unfolded, satellites currently in orbit would help by functioning well beyond their original design lifetimes. Nevertheless, the launch delay created a major challenge that would leave nearly a three-year gap without alternative launchers and would raise important questions about the future of the nation's space industrial base.<sup>45</sup>

Most seriously affected were the operational Global Positioning System (GPS) satellite constellation, the early warning Defense Support Program (DSP), and the satellites controlled by the National Reconnaissance Office. Defense Department planners had programmed these payloads exclusively for Shuttle launches. The Air Force moved immediately to reinforce its expendable launch arsenal. By July 1986 the Air Force had recommended producing an additional 13 Titan IVs, as well as 12 new medium-launch Delta II vehicles to help perform GPS flights beginning in 1989, two years behind schedule. The Delta II proved to be the only booster that resulted directly from the Shuttle crisis. The Air Force expected to launch DSP satellites on

the Titan IV, Defense Meteorological Satellite Program payloads on Titan IIs, Defense Satellite Communications System satellites on Atlas IIs, and the future Milstar on Titan IVs. At the same time, the service strongly supported Advanced Launch System studies designed to determine a successor launch vehicle to the Shuttle and Titan IV.<sup>46</sup>

The Air Force's decision to focus on expendable launch vehicles seemed more credible when NASA announced in May 1987 that Shuttle flights would resume in June rather than February of 1988 and would be limited to 14 instead of 24 per year. Moreover, only lighter payloads would be flown. Under Secretary Aldridge responded by calling for an additional 25 Titan IVs, Titan launch pads, and 5 to 10 more Delta II medium launch vehicles. The under secretary also defended his new space launch budget that would be doubled by the early 1990s. Although military missions would receive priority once the Shuttle resumed flying, eighteen of thirty-six previously manifested payloads for the Shuttle would be reprogrammed for expendable launchers. After 1992, however, the Defense Department would use the Shuttle only for SDI or research and development missions. In effect, the Air Force would abandon the standardized Shuttle, the "airliner to space," for the diversification represented by expendable boosters. At the same time, no one wanted to resort to business as usual and to the practice of linking specific satellites to particular launch vehicles, which required months of prelaunch preparation. Emphasis now would be on developing an "assured launch strategy" highlighted by lower costs and greater launch responsiveness.<sup>47</sup>

While space launchers remained grounded and public questioning of the future direction of the space program continued into 1987, the White House initiated a new review of national space policy. The Air Force also undertook a comprehensive reassessment of its role in space. In the spring of 1987 the Secretary of the Air Force produced an important "White Paper" on Air Force space policy and space leadership. The paper took as its point of departure the 1983 policy letter from then Chief of Staff General Gabriel that claimed Air Force responsibility for most of military space. This claim, according to the White Paper, had not been fulfilled, and the defense community perceived that the Air Force only grudgingly supported space activities. As a result, the nation faced a void in space leadership at a time of growing Soviet space presence, and the Air Force had failed to "exhibit a sense of institutional purpose or responsibility toward space." In short, space had been relegated to fourth priority in the service behind the strategic, tactical, and airlift missions.<sup>48</sup>

Because outsiders perceived a lack of support for space within the Air Force, they raised challenges to the Air Force's role as executive agent for military space. The Office of the Secretary of Defense, for example, retained a dominant voice in the acquisition area through the DDR&E, while U.S. Space Command and the Strategic Defense Initiative Organization advocated space survivability and surveillance

requirements, and the Army and Navy worked on space master plans of their own. The White Paper's authors posed a central question: did the Air Force wish to act as the lead service for space? They declared that the answer should be "yes" because of the service's space expertise and especially the potential of Air Force Space Command for operational leadership. At the same time, however, the Air Force had neither a mission statement for space nor a current space operations doctrine, and its operational space command could not play a strong advocacy role throughout the corporate Air Force and Defense Department because its leader was only a two-star commander.<sup>49</sup>

The White Paper suggested specific actions the Air Force should take to lead the military space community. It should develop a new policy statement that reasserted the Air Force claim as "lead" service for space and should work to revise Defense Department Directive 5160.2 on service space responsibilities. Leadership did not mean an "exclusive" Air Force space role, the paper said. Rather, the service should establish a formal structure to ensure that it met the needs of the other services. Within the Air Force, a corporate commitment could be developed by means of expanding space infrastructure and supporting the SDI and "military-man-in-space" missions. Finally, the Air Force should upgrade the commander of Air Force Space Command to three-star rank and work to increase the interaction among the operational command, Air Force Systems Command, and the Air Staff. The Air Force secretary's White Paper reached a wide audience and provided important impetus to the establishment the following year of the important Blue Ribbon Panel on Space Roles and Missions. Meanwhile, a few months before the White Paper appeared, space operations advocates received a new champion in the person of General John L. Piotrowski, appointed to head U.S. Space Command on 6 February 1987.<sup>50</sup>

### **General Piotrowski Champions Operational Space**

The arrival of General Piotrowski signaled the advent of three years of strong leadership in a variety of operational space areas. His initiatives and actions had significant impact on the thinking and development of Air Force space activities. As commander-in-chief of the unified command, Piotrowski sought to bring an operational focus to the space mission, much of which was accomplished by involving Air Force Space Command, the unified command's largest component. He represented as well a symbolic shift in leadership of the unified command. While his predecessor, General Herres, focused primarily on developing an effective organizational framework, General Piotrowski made it his mission to stress the needs of the warfighter and the importance of normalizing military space operations. As he explained, it was absolutely essential that the unified and specified commanders-in-chief, the Joint Chiefs of Staff, and Defense Department leaders develop an "operational mindset for the use of space." This would reflect the "natural process of

maturing space operations from a research and development orientation to an operational mode for the employment of US space-based resources.”<sup>51</sup>

General Piotrowski used as a springboard the new Defense Department Space Policy that Secretary of Defense Caspar Weinberger signed on 4 February 1987. The new policy affirmed that the Shuttle would no longer be designated the primary launch vehicle for military missions. The nation must develop an assured space mission capability through balanced launch assets and more survivable systems. Moreover, the military should develop an operational antisatellite weapon system, take advantage of civil and commercial space assets, and promote advanced launch technology. Above all, the Defense Department must “provide operational capabilities to ensure the US can meet national security objectives” by focusing on the mission areas of space control, space support, force enhancement, and force application. The Joint Chiefs of Staff called on the new commander of U.S. Space Command to assess current programs and required actions. Although Piotrowski used his position to advocate a variety of improvements in space infrastructure, his attention centered on space launch and future operational payload requirements that would support theater and tactical commanders.<sup>52</sup>

General Piotrowski believed that the Air Force needed to make radical changes in two areas of space launch—payload manifest procedures and launch responsiveness—in order to make operational priorities the driving force. U.S. Space Command and Air Force Space Command, for example, played only a minor role in launch manifest arrangements. From the 1970s the Defense Department Space Shuttle User Committee had essentially “rubber stamped” payload manifest schedules determined by Air Force Systems Command’s Space Division. In September 1985, the redesignated Defense Department Space Launch User Committee began addressing expendable-booster manifest requirements, but the *Challenger* accident interrupted its work. When NASA and Space Division reviewed the Shuttle recovery schedule in the fall of 1986, they did not contact the services or the unified and specified commands for their inputs. Piotrowski considered this situation a prime example of the “technology push” rather than the “requirements pull,” whereby space assets and needs traditionally reflected the concerns of the technologists rather than the warfighters. As he explained,

I believe it is vitally important for the operational requirement to be present in the decision-making process....[O]ur role should be to act as an operational consultant to ensure the risk-vs-requirement discussion is not based solely on technical and programmatic concerns. I recommend for future launches of DoD systems, by either NASA or Systems Command, that US Space Command perform that consultant role.<sup>53</sup>

Specifically, he proposed that U.S. Space Command be accorded formal voting membership on the user committee, now termed the Space Launch Advisory Group. His proposal, however, became part of the thorny issue of “normalizing”

the relationship between his command and his component Air Force Space Command. By 1987, he agreed with Under Secretary Aldridge and Major General Maurice C. "Tim" Padden, commander of Air Force Space Command, that the Air Force component should represent U.S. Space Command interests at user meetings. In any event, now operators would be more directly involved.<sup>54</sup>

General Piotrowski also spearheaded the effort to achieve a more responsive space launch capability. The problem with manifesting space payloads led him to reassess the issue of responsiveness in the context of deterrence and warfighting. Current policy, he argued, only guaranteed a return to a peacetime capability and a gradual recovery from the launch standdown. This would mean a relatively rigid "launch on schedule" policy that often required as much as six months of preparation by contractor personnel before each launch. Such practices did not provide the responsive space infrastructure needed for warfighting. Moreover, "deliberate" on-orbit checkout procedures by Air Force Systems Command's Space Division meant that space systems remained under control of the research and development community too long before transfer to operational users. Piotrowski believed that the best way to ensure a launch system responsive to the warfighter would be a complete transfer of the launch mission from Space Division to Air Force Space Command. He formally proposed the transfer in a letter to Chief of Staff General Larry D. Welch on 28 September 1987. Launch transfer, he argued, would represent a natural evolution as Air Force Space Command matured in its operational role and would enable the commander-in-chief of U.S. Space Command to use his component directly for launch-related activity in wartime. He also advocated an Air Force "blue suit" launch operation managed by the operational commands. He proposed that Air Force Space Command immediately assume operational responsibility for either the test ranges or upcoming Delta II/GPS launches.<sup>55</sup>

General Piotrowski and his fellow space operators believed that developments in the wake of the *Challenger* tragedy supported their argument. For one, a special Defense Department commission on defense management practices led by former Deputy Defense Secretary David Packard called for acquisition commands to concentrate on research, development and acquisition by divesting themselves of "operational" responsibilities. This led to the transfer in 1987 of the Air Force Satellite Control Network, including the remote tracking stations, from Air Force Systems Command to Air Force Space Command. Piotrowski hoped that this transfer would provide sufficient incentive for reconsideration of the launch issue. At the same time, recent Defense Department policy relegating the Shuttle to second priority behind expendable boosters effectively sealed the fate of Air Force Space Command's expectation to control military space launch through its Shuttle responsibilities. By February 1987 the Defense Department had decided to cancel funding and development of the Shuttle Operations and Planning Complex (SOPC) at Falcon Air Force Station and to mothball the Shuttle launch complex at



Vandenberg Air Force Base. As a General Accounting Office report suggested, cancellation of the SOPC also represented an end to dedicated military manned spaceflight efforts for the foreseeable future.<sup>56</sup>

Most affected was the Military-Man-in-Space project supported by Under Secretary Aldridge. When it began in 1985 this program embraced a study of potential tests aboard the Shuttle and military uses of on-orbit satellites. After President Reagan announced support for NASA's Space Station *Freedom* in January 1984, the Air Force also examined the possibility of participating in certain space station experiments. The problem, however, remained the Air Force's traditional inability to specify requirements that could be achieved only by military personnel aboard a space station. As a result, the Defense Department continued to question Air Force involvement in manned spaceflight, while political support in the late 1980s threatened to eliminate the space station altogether. Nevertheless, the Air Force persisted with the low-priority Military-Man-in-Space project, directed largely from Air Force Space Command, which had established an office in 1987 to provide "centralized focus for all Air Force military manned activities in space." Air Force officials hoped that reorienting the program's objective from earth observation to more technically demanding uses of military astronauts involving analysis and processing of data would prove more worthy of funding support. With the decline of military interest in the Shuttle and the space station's future in doubt, however, planners developing experiments for Shuttle flights in the early 1990s had no certainty they would be flown.<sup>57</sup>

With the return to expendable launchers and no provisions for turning over to Air Force Space Command the new Titan IV and Delta II boosters, the Defense Department's shift to expendable launch systems revitalized Air Force Systems Command's central role in launch operations and reinforced the status quo. Piotrowski's initial effort with the space launch issue proved unsuccessful. In denying his request in December of 1987, Air Force headquarters argued that the disruption involved in such a transition would adversely affect the launch recovery process. At the same time, even an Air Force Space Command study had raised questions about the lack of expertise within the command to handle a rapid rather than evolutionary transition. Further progress would have to await the renewed momentum in late 1988 created by the Blue Ribbon Panel on Space.<sup>58</sup>

General Piotrowski's initiatives on space manifesting and space launch should be considered as part of the U.S. Space Command and Defense Advanced Research Projects Agency (DARPA)-led "space in transition" movement that involved all elements of the space community in the late 1980s. From Piotrowski's perspective, the Air Force had to transition its force posture from one of remoteness to the concerns of the commanders-in-chief to one that ensured integration with warfighters' requirements. It should do this by emphasizing the interrelationship among survivable space systems and quick-reaction launch capabilities. These issues surfaced

in early 1988, when Piotrowski surveyed the commanders-in-chief and theater commanders on their dependency on space systems. In response, the commanders declared that they had found weather, intelligence, and communications satellite information increasingly necessary for their operations, but they bemoaned their inability to control these assets. The unified space command chief's survey also revealed that without having access to weather and communications from satellites in a crisis situation, the commanders-in-chief did not conduct training to use this information. Piotrowski focused on the satellites themselves, particularly the trend toward multimission, multiuser satellites. They had proven cost-effective and capable of satisfying a broad spectrum of requirements, but had they met user needs? Piotrowski and his counterparts thought not.<sup>59</sup>

Piotrowski's "responsive" proposal called for developing many small, low-cost, single-mission satellites that could be launched on short notice and receive early on-orbit checkout. As such, they would be readily available for theater commanders. DARPA, which did not favor the practice of hardening satellites and producing more complex spacecraft, had long advocated cheaper, lighter satellites (LIGHTSATS) and a survivable launch capability through its Advanced Satellite Technology Program. In the early 1980s, however, an assessment by the Office of the Secretary of Defense recommended retaining high-altitude deployment of multi-mission satellites. Over the course of the decade theater commanders, the Strategic Air Command, and the Strategic Defense Initiative Organization increasingly looked to so-called cheap satellites (CHEAPSATS) as the best means of satisfying theater weather, communications, reconnaissance, and intelligence requirements during a crisis. The Air Force became most interested in the possibility of lightweight communications satellites to complement existing networks in a "communications by the yard" approach to fulfill theater needs not met by current systems. Piotrowski and others saw small satellites as a key means to transition from the existing peacetime situation to a more responsive warfighting posture and, thus, to realize the objective of assured access to space. Moreover, a quick-reaction "on-call" launch response would meet operational needs and help institutionalize space inside and outside the Air Force. Such a capability would involve simpler, smaller, short-life payloads launched aboard a standardized bus by quick-reaction launchers from multiple launch sites across the country. Short-term tactical satellites from a mixed-fleet arsenal could meet important surge requirements of wartime commanders.<sup>60</sup>

### **The Blue Ribbon Panel Provides a Space Agenda**

Like General Piotrowski's other space launch concerns, discussion of responsive light satellites became overshadowed in 1988 by deliberations of the Blue Ribbon Panel on Space Roles and Missions, which proved to have the most far-reaching influence of the many space panels and studies over the years. In the spring of 1988 Air Force Chief of Staff General Welch formed a Blue Ribbon Panel consisting of

senior representatives from all major Air Force commands to assess Air Force space issues. The Vice Chief of Staff of the Air Force chaired an Executive Steering Group that included Lieutenant General Donald J. Kutyna, commander of Air Force Space Command, and vice commanders from the other Air Force major commands. The main work would be done by the Panel Study Group, headed by Major General Robert Todd, vice commander of Air University. Echoing the 1987 White Paper on space, the chief of staff justified another study on space in terms of major changes in the space landscape that resulted from new policy statements by the Defense Department and the White House, technical advances, and the potential of SDI, as well as friction and funding problems with the other services. He worried above all about the ambivalence toward space in the Air Force. While the service had played a leading space role for thirty years and continued to garner 50 percent of the national space budget and 75 percent of the Defense Department's space funding, it remained uncertain about its future space role. The commitment of Air Force leaders to the institutionalization of space, he asserted, was not shared throughout the service. This resulted from misunderstanding about the potential of space systems, a multiuser approach to systems that placed space at a disadvantage in the budget process, and the historically closed nature of the space community.<sup>61</sup>

General Welch charged the panel to examine the role of space for the warfighter, responsiveness of space systems, and organizational relationships. After deliberating over the summer, the panel issued a report in August 1988 that dealt with three broad areas. First, Air Force space policy should be revised to reflect realistic capabilities and pretensions. This meant an Air Force role as principal, but not exclusive, agent for military space activities and a major effort to achieve the capability of performing warfighting missions in and from space. Secondly, the panel assessed the Air Force role in space in terms of the four mission functions described in the 1983 Air Force Space Plan. For these, the panel recommended a reasoned approach involving acquisition, operation, and support of military space systems. Finally, the panel investigated the organizational, institutional, and personnel issues associated with the role of space in the Air Force. The panel asserted that Air Force Space Command must continue its central role as advocate, operator, and single manager for space support, while U.S. Space Command should normalize its relationship with its Air Force component by returning to it operational control of peacetime space assets. The institutional challenge had occurred because many viewed space systems as vulnerable during conflict, without an assured mission capability of providing ready space system replacements. Generally, there continued to be a lack of broad institutional involvement in the space program, an absence of space expertise in the various commands, and overall minimal appreciation of the value of space throughout the Air Force. The panel concluded its evaluation by specifically recommending that doctrinal manuals be revised to include space in combat operations, and that space expertise be spread throughout the service.<sup>62</sup>

After receiving the Blue Ribbon Panel's report in late 1988, Air Force headquarters in February 1989 issued an implementation plan designed to realize the panel's twenty-nine specific action recommendations. The implementation plan declared in ringing words that "the Air Force is and will be responsible for the global employment of military power above the earth's surface." The plan expected to lay the groundwork for establishing a decisive space role in combat operations. The Air Force must foster among itself and the other services a "broader institutional view of how military power is applied above the surface of the earth." It charged Air Force Space Command with developing a "Space Roadmap" for updating the Air Force Space Plan and integrating all existing Air Force space operations. The Space Roadmap, projecting space into the 21st century, would link space systems to warfighting requirements, global strategy, and the four mission areas. The implementation plan asserted that "spacepower" would assume an importance equal to airpower in future combat and that the Air Force must ready itself for the "evolution of spacepower from combat support to the full spectrum of military capabilities." Above all, the road-map had to lead to a "coherent Air Force role in space."<sup>63</sup>

The Blue Ribbon Panel report and the Air Staff's implementation plan provided necessary momentum on a number of important space issues. They helped the Air Force space community, primarily Air Force Space Command, pull the rest of the Air Force along the path to an improved and clearer understanding of, and vision for, the space mission for the Air Force. Although Air Force Space Command's revision of the Space Plan continued to face opposition at Air Force headquarters, prospects for approval had brightened in light of the various ongoing studies. These included the Space Roadmap, an Air Force Investment Strategy for Space directed by the Assistant Air Force Secretary for Space, and an Assured Mission Support Space Architecture Study led by U.S. Space Command. In addition, doctrinal statements that had long been controversial faced good prospects for approval given the Panel's recommendation that the Air Force promote the "direct integration of space operations with the Air Force's more traditional roles." Moreover, the Panel's call for "normalization" of space led to a change within the Air Force board structure, whereby Air Force Space Command received a "home board" for space in order to effectively advocate space systems for several users.<sup>64</sup>

The Blue Ribbon Panel's findings also led to important changes in the relationship between U.S. Space Command and Air Force Space Command. The Panel called on the unified command to establish a more effective relationship with its component commands, especially Air Force Space Command, by relinquishing peacetime operational control of the space surveillance and missile warning functions. U.S. Space Command personnel had been exercising operational control over these Air Force assets since the separation of the two commands on 1 October 1986. Air Force Space Command leaders argued that as a component command it should

serve as the focal point for the management and operation of Air Force strategic defense space assets and command, control, and communications systems in support of NORAD and U.S. Space Command. Under pressure from Air Force headquarters, General Piotrowski's command, by November 1988, had agreed to transfer to Air Force Space Command the Space Surveillance Center functions through the formation of a new organization, the Air Force Space Surveillance Element. The unified command, however, proved less forthcoming in transferring to its Air Force component command the three other Cheyenne Mountain Complex operations centers: the Missile Warning Center, the Space Defense Operations Center, and the Intelligence Operations Center. Air Force Space Command expected to gain responsibility for these remaining centers in the early 1990s, when the commander of Air Force Space Command once again would be dual-hatted as commander-in-chief of U.S. Space Command.<sup>65</sup>

Panel recommendations also supported the major effort to develop effective new launch technology through the Advanced Launch System (ALS) program. By the end of 1989 the ALS had evolved from a technological initiative to produce a heavy launch vehicle for the Strategic Defense Initiative and future space station to a multivehicle technology-oriented project. Not all participants approved of the restructured program's objectives, which eliminated production of the vehicle itself.

Space architecture studies during 1984 and 1985 based on Strategic Defense Initiative requirements had identified the need for a launch vehicle capable of placing at least 200,000 pounds into low-earth orbit. By 1987 the Strategic Defense Initiative Organization called for a capability of nearly 400,000 pounds per year into low-earth, polar orbit by 1993, with an expected increase to 5 million pounds per year by the end of the 1990s. Air Force officials, including Under Secretary Aldridge expected ALS also to meet future Air Force requirements for large multi-user satellites that could not be handled by the Shuttle or Titan IV, although General Piotrowski and Air Force Space Command planners feared that ALS furthered peacetime rather than wartime objectives by undermining their initiatives to produce tactical satellites of less size, weight, and complexity. Meanwhile, NASA had joined the competition by proposing an unmanned derivative of the Shuttle, termed Shuttle-C (Cargo). By the late 1980s, however, the climate of fiscal austerity and strong opposition to the prospect of space-based missile defense systems raised doubts about proceeding with an ALS program aimed only at producing a large new booster to support the Strategic Defense Initiative.<sup>66</sup>

Air Force Space Command led the effort to restructure the program to support development of a new "family of vehicles" that by the late 1990s could provide responsive, reliable, low-cost access to space for a variety of payloads. But with funding in short supply, might the launch dilemma be better addressed with a technology-only program directed toward improving the existing fleet of expendable boosters? This recommendation emerged from a 1989 Defense Science Board

study of space launch. Board members argued for limiting ALS to a study and technology program without a full-scale development phase, because upgraded expendable launch vehicles would meet operational requirements for the foreseeable future. Air Force Space Command wanted ALS, now termed the Advanced Launch Development Program (ALDP), to address requirements for an operational launch system rather than merely focus on upgrading existing launch vehicles. The larger issue had become the classic development dilemma of whether to continue investing in improvements to systems based largely on 30-year-old technology or, instead, to support promising but unproven technology that might result in a family of launch vehicles that Air Force Space Command argued could provide “responsive, reliable, flexible, low cost access to space for the broad range of expected payload sizes, orbits and launch rates...essential to satisfy...requirements in the late 1990s and beyond.”<sup>67</sup> By the end of the 1980s, the uncertainty of space launch for the future compelled the vice president’s National Space Council to schedule a major assessment of the issue in 1990 or 1991.<sup>68</sup>

### **Air Force Space Command Gains the Space Launch Mission**

If the Blue Ribbon Panel’s findings did not lead to clarification of the Advanced Launch System program, they nevertheless helped produce major changes in the Air Force space launch mission. By the time the Blue Ribbon Panel’s *Implementation Plan* appeared on 3 February 1989, the country had just completed its “year of recovery” for “assured access to space.” The Titan 34D had returned to service with launches from both coasts; the first of the refurbished Titan II’s for Defense Meteorological Satellite Program flights began operations in September; and the new Titan IV would enter the inventory with projections of three to five flights per year. Additionally, the new Delta II medium launch vehicle would make its first flight with Global Positioning System satellites in early 1989, and the Air Force had issued a contract for a second medium launch vehicle, a stretched version of the Atlas-Centaur for Defense Satellite Communications System launches.<sup>69</sup> The Blue Ribbon Panel had applauded the recovery of the expendable launch vehicle industry and mission. It also created momentum for transfer of the space launch mission from Air Force Systems Command to Air Force Space Command, and led to a revised Air Force Space Policy in December 1988 that declared that the Air Force would “consolidate space system requirements, advocacy, and operations, exclusive of developmental and, for the near term, launch systems, in Air Force Space Command.” Although the policy stopped short of reassigning the launch function, it clearly reflected a central objective of the Blue Ribbon Panel, namely to institutionalize the role of Air Force Space Command as the focal point for operational space activity. Increasing awareness of Air Force Space Command’s responsibilities and the importance of space in the Air Force set the stage for action on the launch transfer issue.<sup>70</sup>

After General Piotrowski failed in late 1987 to convince Air Force leaders to transfer the launch mission, he relinquished the burden of advocacy to Lieutenant General Donald J. Kutyna, the new commander of Air Force Space Command. In February 1988, General Kutyna provided Air Force Chief of Staff General Welch a lengthy rationale for transferring launch responsibility that became the command's basic position in the months ahead. Space boosters, he argued, while complex and costly vehicles, represented operational rather than developmental systems, yet Air Force Systems Command's research and development personnel performed operational tasks involving range and launch pad operation, supervision of contractor personnel, and execution of launch countdown checklists. These could, and should, be handled by "operators" who could boast of considerable experience with current boosters over the years. General Kutyna favored a "clean stroke" transfer similar to that involving the Satellite Control Network rather than a piecemeal change. At the same time, Kutyna and his staff had always understood that such a transfer would require resolution of difficult budget, manpower, and contractor issues, as well as interface challenges with NASA and the classified programs, along with responsibilities for upper-stage vehicles.<sup>71</sup>

General Welch, however, reaffirmed his earlier opposition, and the launch transfer issue joined a number of other concerns that would have to await Blue Ribbon Panel deliberations. In the new climate for change following publication of the implementation plan, General Welch directed the Air Staff in late May 1989 to review responsibilities of Air Force Space Command and Air Force Systems Command in order to recommend "a more normal relationship between developers and operators." Subsequently, Air Force headquarters directed both commands to prepare and discuss with each other their positions on space launch. By the end of the year, the two sides continued to differ fundamentally on the nature and control of space systems. Air Force Systems Command proposed a lengthy, phased turnover of individual launch vehicles, but only after sufficient improvements had been made to make them "operational." Space Command, by contrast, favored immediate transfer of space launch, represented at this time by the Space and Missile Test Organization, as well as all residual satellite control operations. In his presentation to General Welch in March 1990, General Kutyna declared that the transfer would enhance operational effectiveness in four ways. Making a single command responsible for the entire space support function would ensure unity of command, render systems more responsive to the warfighter, improve methods for the formulation of operational requirements, and assist the acquisition community by freeing it from performing operational functions. The Air Force Space Command chief also countered the objections of Air Force Systems Command representatives which centered on potential disruption to classified reconnaissance programs and contractor arrangements, and especially on what they considered the specialized, nonoperational nature of space systems.<sup>72</sup>

Although General Welch agreed with General Kutyna's basic position, he preferred to forego an immediate transfer and, instead, appointed a Launch Operations Transfer Steering Committee to examine various options for an effective transfer with minimal disruption. The goal would be to produce a plan "to bring launch operations into line with the normal division of roles and missions between operational commands and the acquisition command." Included among the committee members were Lieutenant General Ronald W. Yates and Major General Thomas S. Moorman, Jr., who would soon assume command of Air Force Systems Command and Air Force Space Command, respectively. In the spring of 1990 the committee examined sixteen options that in one way or another compared Air Force Space Command's position, which supported a direct transfer leaving launch systems to become more "operational" in the future, and Air Force Systems Command's argument, which favored an incremental transfer after first improving the launch systems to make them "operational." In mid-May General Welch agreed to the committee's compromise recommendation, which clearly favored the operational command. On 1 October 1990, Air Force Systems Command would transfer to Air Force Space Command its launch-related centers, ranges, bases, and the Delta II and Atlas E missions. The remaining Atlas II, Titan II, and Titan IV missions would be turned over later on a phased schedule. Approving the transfer on 12 June, Secretary of the Air Force Donald B. Rice declared that the "change in assignment of roles and missions further normalizes space operations and pursues our corporate commitment to integrate space power throughout the full spectrum of Air Force operational capabilities."<sup>73</sup>

It was left to General Moorman, in ceremonies on 1 October at Patrick Air Force Base, Florida, marking the transfer, to best describe the "landmark event."

I believe this transfer is part of the natural evolution of the Air Force space program. It is a testimony to how our thinking about space operations has matured....[O]ver the past several years our leadership has been examining the role of the Air Force in space as well as that of space in the Air Force. The result of this review is an Air Force policy which has two basic tenets—that the future of the Air Force is inextricably tied to space, and that spacepower will be as decisive in future conflicts as airpower is today. The policy also states that we will make a solid corporate commitment to integrate and normalize space throughout the Air Force....[T]his transfer of launch responsibility is the tangible result of the Air Force's desire to fulfill these policy objectives. The decision to transfer the launch mission was based on the beliefs that placing satellites into orbit has matured to a point where it should be considered an operational task, and that Air Force Space Command had sufficiently matured where it could assume the responsibility....The transfer...is intended to be virtually transparent to both the users and operators. That transparency will help guarantee continued smooth



operation of launch activities and will establish a foundation for moving forward toward normalizing our military access to space.<sup>74</sup>

The transfer of space launch represented not only the “most significant operational milestone” in the command’s brief history, but a major step on the road to an operational, warfighting perspective for space.<sup>75</sup>

### The Decade in Retrospect

By the end of the 1980s, the Air Force was well on its way toward achieving the institutionalization of space that enthusiasts had long envisioned. Space activity no longer seemed primarily developmental in nature but, rather, an operational element whose systems could fulfill Air Force missions in a manner comparable to the service’s traditional activities. Over the course of the decade the space launch issue remained central to every aspect of the space program. Without assured access to space there could be no space program. In the atmosphere of self-examination following the *Challenger* tragedy and the Titan booster failures, the Air Force at the highest levels moved to reassess not only its investment in the Shuttle but its entire commitment to space.

The *Challenger*’s shock waves generated a variety of space studies that attempted to understand the present and chart the future. Of these, the Blue Ribbon Panel far and away provided a realistic sense of the potential of space through its policy analysis, and its examination of the Air Force role in space and the role of space in the Air Force. It called on the Air Force to undertake sober leadership, and it set the stage for the Space Roadmap. The Blue Ribbon Panel’s recommendations served as the linchpin for the broad process of “normalizing” space within the Air Force that gained momentum in the late 1980s.

To be sure, much remained incomplete at decade’s end. While the return to expendable boosters enabled the service to continue launching communications, weather, navigation, and early warning satellites, it would be 1992 before the three-year Shuttle delay would be overcome. At the same time, roles-and-missions issues continued to demand accommodation between the United States Space Command and its component Air Force Space Command, as well as among the latter and other Air Force and Defense Department organizations with space responsibilities. Likewise, the future of space launch also persisted unresolved. A return to the diversity of reliable space boosters did not alleviate troublesome questions about the feasibility and necessity of developing a standardized launch vehicle for the new century.

Nevertheless, the end of the decade offered more hope than pessimism. Through all the turmoil surrounding space launch in the movement away from the Shuttle, the focus remained centered on operational requirements and the needs of the warfighter. In this regard, Air Force Space Command provided the focus as it moved to consolidate operational responsibilities. Its victory in garnering the space launch mission represented a final shift in the long struggle to move Air Force space from

the research, development, and acquisition community to the operational arena. The Air Force had proclaimed itself the lead service for military space. Only a policy, infrastructure, and institutional commitment wholly oriented toward space operations could provide the conditions to achieve the claim in reality. At the close of the decade, General Kutyna, commander of Air Force Space Command, best described the promise and potential of the Air Force space challenge. He said the Blue Ribbon Panel had determined that:

spacepower will assume an increasingly decisive role in future combat operations, and the future of the Air Force is inextricably tied to space. We are at the forefront in the evolution of spacepower from combat support to an actual warfighting capability. Spacepower is important today, but it will be absolutely critical in the future for effective military operations.<sup>76</sup>

General Kutyna's prediction would soon be put to the test in a major regional conflict in Southwest Asia, Operation Desert Storm.